



Hydration Technologies, Inc. – HydroWell 24

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Device Information

The Hydration Technologies, Inc., (HTI) HydroWell 24 is a portable passive water treatment device utilizing an osmotic membrane for pathogen reduction. This device is designed for group use, to be left stationary during operation. The device consists of a plastic bucket with enclosed osmotic membrane cartridge, 5 vinyl 1.6 L nutrient charge syrup bags, and cleaning supplies (metabisulfite solution). The device requires the user to supply the collection vessel for product drink. The membrane cartridge utilizes the same semi-permeable membrane as other HTI products (Hydropack, X Pack), with greater surface area for increased production rate. According to the manufacturer, the membrane, although unlike conventional porous membranes, is equivalent to having a pore size of 0.0005 μm . This device uses no pumping to process the water, but rather uses osmotic potential across the membrane as a driving force. A nutrient charge of sugar and electrolytes pulls water across the membrane by creating an osmotic potential. To reduce this potential and equilibrate the solute concentration across the membrane, water is drawn from the less concentrated to the more concentrated side of the membrane until equilibrium is reached. The finished product is a sports drink similar to Gatorade[®]. Water production rate is proportional to solute gradient. The following nutrition information was approximated based on data from the HTI X Pack device, but substituting a 3% solution for the HydroWell 24 drink produced (Table 1). This information is based per 1 L drink produced.

Table 1. HydroWell 24 Nutrient Charge Nutritional Information.

Parameter	Value/L Product
Calories	122
Total Fat	0 g
Sodium	17 g
Potassium	69 g
Sugars	30 g
Protein	0 g

Ingredients: fructose, water, citric acid, lime extract, sweetness enhancer, potassium citrate, sodium citrate, sodium benzoate, potassium sorbate.

Note: According to the manufacturer, the nutrient charge is undergoing reformulation.

[®] Gatorade is a registered trademark of the Quaker Oats Co., Chicago, IL. Use of trademarked products does not imply endorsement by the U.S. Army, but is intended only in identification of a specific product.

Effectiveness Against Microbial Pathogens

Manufacturer in-house data showed virus reduction in excess of 4-log (reference 1). Results from an independent laboratory for a similar device (HTI, Inc., X Pack) show bacteria reduction in excess of 6-log (reference 2). No results were received that tested this device against the U.S. Environmental Protection Agency (USEPA) Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 3). Expert opinion states that this technology should be capable of meeting the log reduction requirements shown below when tested against the USEPA Standard for the manufacturer rated capacity of the device. The removal mechanism of osmotic membranes is complex but can be considered to be based on size exclusion utilizing very small pores that reject even dissolved contaminants. Based on the absence of independent results challenged against reference 3, this device is assigned a rating of one √ for the reduction of each pathogen ([click here](#) for rating explanation), indicating that expert opinion expects this device to meet the requirements of reference 3 (Table 2).

Table 2. Expected Performance Against Microbial Pathogens.

Microbial Pathogen Type	Expected Disinfection Capability	Evaluation Rating	Primary Pathogen Reduction Mechanism
Bacteria	> 6-log	√	size exclusion
Viruses	> 4-log	√	size exclusion
<i>Giardia</i> cysts	> 3-log	√	size exclusion
<i>Cryptosporidium</i> oocysts	> 3-log	√	size exclusion

Production Rate and Capacity

Production rate and capacity of this device is dependant upon solute gradient across the membrane and temperature. Manufacturer stated production rate is 1 L/hr at 68° F (0.017 L/min). The production capacity is 24 L per day with a useful life of 30 days. Unlike porous pressure driven filter devices, turbidity does not affect the production capacity or rate.



Cleaning, Replacement, and End of Life Indicator

The HydroWell 24 is designed for 30 days of use with flushing every 3 - 7 days. The device has no real-time end of life indicator. This device is purchased with 5 1.6 L nutrient charges, capable of producing water continuously for about 13 days. Additional nutrient charges can be purchased for water production of up to 30 days. At the end of 30 days from first use the device should be discarded.

Weight and Size

The dry weight of the device is 16,300 grams.
Dimensions are (H x W x L) 40 cm x 33 cm x 34 cm.

Cost

HydroWell 24 (nutrient charges for 320 L)	\$294.00
Resupply Kit (nutrient charges for 320 L)	\$57.00

Device Evaluation

No laboratory data was received for the Hydration Technologies, Inc., HydroWell 24 challenging the device against the standards in reference 3. Since the device utilizes the same membrane, but in a different configuration, as the Hydration Technologies, Inc., X Pack, the results showing > 6-log reduction of bacteria for that device apply to the HydroWell 24. Based on the characteristics of osmotic membranes, reduction of viruses (> 4-log) and cysts (> 3-log) should be obtainable (reference 4). Since nutrient charge is necessary to create the osmotic potential, the liquid produced is not water, but a drink similar to commercial sports drinks. The device is designed to be used for 30 days with cleaning every 3 - 7 days for a total capacity of 720 L. This is a large device, designed for multiple users and once set-up to process water should remain in a stable environment. This device has no real-time indicator of process failure. Small defects in the membrane may allow pathogens across the membrane and be consumed without notice. No information was received as to the cleaning process for this device. Cleaning should be assumed to follow that for the HTI, Inc., Hydrowell Expedition. The manufacturer states a storage life of 3 years when kept below 90° F.



Advantages

- Technology is capable of reducing microbial pathogens in accordance with the USEPA Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 3).
- Osmotic membrane capable of rejecting microbial pathogens and most all other environmental contaminants.
- No chemicals required.
- Unaffected by raw water turbidity.

Disadvantages

- No test results showing compliance with the USEPA Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 3).
- Slow production rate.
- Not portable once water processing is initiated.
- Large size, not for individual use.
- No real-time indicator of process failure.
- Does not produce water; product is similar to a sports drink.

References

1. Manufacturer in-house laboratory test results showing >4 log reduction of virus, 2003. Provided by HTI.
2. Independent laboratory results of tests showing >6 log reduction of bacteria, 2001. Provided by HTI.
3. USEPA, 1989. Guide Standard and Protocol for Testing Microbiological Water Purifiers. *Federal Register*. 54:34067.
4. U.S. Army Center for Health Promotion and Preventive Medicine, 2005. *Technical Information Paper; Filtration in the Use of Individual Water Purification Devices*, Aberdeen Proving Ground, MD.

